Improved device for operating venetian blinds situated inside sealed cavity glass panes or double-glazing units

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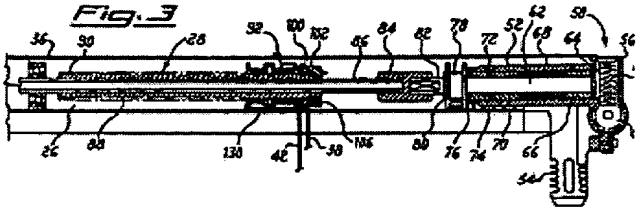
Device for effecting both the upward and downward movements of venetian blinds and the tilting movement of their slats by means of the actuation of a single mechanism. The venetian blinds (30), inserted in cavities (24) between glass panes (12, 14) of double-glazing units (10), are activated upwards or downwards by a plurality of flexible cables (38) designed to be accommodated by helical grooves (90) formed on the side surface of cylindrical winding devices (88) rotated by a shaft (86) common to all the winding devices (88), said winding devices having their helical grooves (90) also engaged in correspondingly threaded holes (94) of rocker elements (92) provided with slots (96) designed to accommodate a plurality of flexible cables (42) controlling, with their movement, the tilt of slats (32) which form the venetian blinds (30), where the rocker elements (92) initially rotate with the cylindrical winding devices (88), influencing the tilt of the slats (32), and then stop against cradles stops (130) present on one side of a frame (26) housing the said devices for operating the blind.



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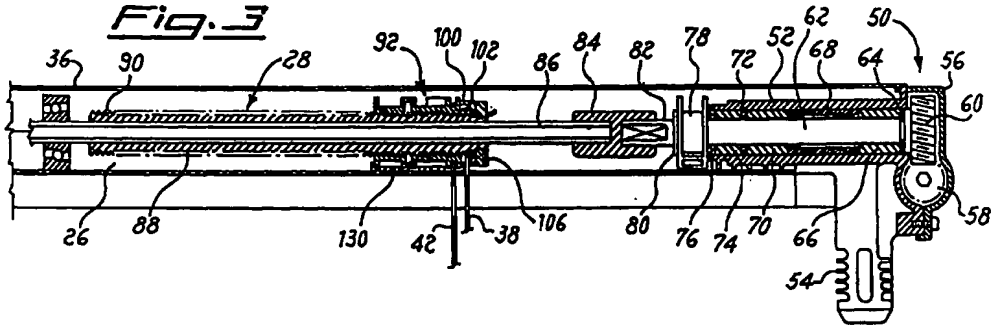
(54) Improved device for operating venetian blinds situated inside sealed cavity glass panes or double-glazing units

(57) Device for effecting both the upward and downward movements of venetian blinds and the tilting movement of their slats by means of the actuation of a single mechanism. The venetian blinds (30), inserted in cavities (24) between glass panes (12, 14) of double-glazing units (10), are activated upwards or downwards by a plurality of flexible cables (38) designed to be accommodated by helical grooves (90) formed on the side surface of cylindrical winding devices (88) rotated by a shaft (86) common to all the winding devices (88), said winding devices having their helical grooves (90) also engaged in correspondingly threaded holes (94) of rocker elements (92) provided with slots (96) designed to accommodate a plurality of flexible cables (42) controlling, with their movement, the tilt of slats (32) which form the venetian blinds (30), where the rocker elements (92) initially rotate with the cylindrical winding devices (88), influencing the tilt of the slats (32), and then stop against cradles stops (130) present on one side of a frame (26) housing the said devices for operating the blind.

Fig. 3



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Description

[0001] The present invention relates to a device for operating venetian blinds, situated inside sealed-cavity glass panes or hermetically sealed double-glazing units, of the type having a single sealed mechanical actuating means which imparts movement inside the cavity so as to allow both the upward and downward movement of the blind and the tilting movement of its slats.

[0002] A hermetically sealed double-glazing unit is known from European patent application No. EP 0 589 496 A1, in the name of the same applicant, formed by two glass panes bonded to a structural frame, incorporating a venetian blind, the tilt of the slats thereof being controlled by means of a mechanism inserted in the frame. This hermetically sealed double-glazing unit is undoubtedly effective but has two main drawbacks:

a) it requires a highly complicated mechanism which occupies at least three sides of the abovementioned frame;
b) it is only able to control the tilting movement of the slats of the venetian blind with no control over the upward or downward movements of the blind inside the double-glazing unit.

[0003] In fact, for safe and easy operation of venetian blinds, a mechanism that is as simple as possible and can perform both the upward and downward movement of the venetian blind as well as the tilting movement of its slats is needed.

[0004] The abovementioned mechanism, in accordance with the present invention, occupies only one side of the frame defining the double-glazing unit and effects both the upward and downward movement and the tilting movement of the slats of a venetian blind housed in the double-glazing unit.

[0005] Essentially, a device in accordance with the present invention for operating venetian blinds, comprising a plurality of slats situated inside glass cavities which are hermetically closed and formed by two glass panes gripping between them a sealed frame which defines between the two panes an air chamber isolated from the external environment and enclosing an atmosphere to be kept dehumidified, is characterized in that the frame comprises three sides forming chambers for storing gas-drying substances and a fourth upper side which is hermetically sealed and contains a mechanism for actuating the venetian blind, comprising a plurality of winding devices capable of winding up and unwinding a plurality of first cables which, being wound up on the winding devices, move the venetian blind upwards and, being unwound by the same winding devices, move the venetian blind downwards and a second plurality of rocker elements, which are screwed onto the winding devices and drive a plurality of second cables which are closed in a loop and which, by means of their movement in one direction and in the opposite direction, adjust the tilt of the slats of the venetian blind and which act as a stop for the winding point of the first cables.

[0006] In particular, the sides of the frame are connected together by simple corner pieces and the upper side is connected to a first lateral side by a simple corner piece and to a second lateral side by a mechanised corner piece provided with sealed means for activating the mechanism actuating the venetian blind.

[0007] Moreover, in particular, the sealed actuating means contained in the mechanised corner piece consist of a reduction gear formed by a helical roller and by a cylindrical toothed wheel with helical teeth, engaged onto a stepped shaft which forms a hermetic seal with the external casing of the corner piece by means of a set of gaskets arranged between the stepped shaft and the external casing.

[0008] Preferably, the stepped shaft is kept positioned inside the casing by a first Seger ring which supports a first metal bush, followed by a spacer and then by a second metal bush and by the internal sealing assembly formed by a first O-ring gasket, by a spacer, by a second lip gasket, by a rocker which retains the gaskets and finally by a second Seger ring, the stepped shaft terminating in an end designed to be inserted into a coupling which connects the stepped shaft to a differently shaped shaft common to all the winding devices arranged in the upper side of the frame.

[0009] In particular, the shaft common to all the winding devices is a polygonal shaft, preferably a shaft with a hexagonal cross-section.

[0010] Preferably, the winding devices are solid cylinders provided with an axial hole corresponding to the cross-section of the common shaft.

[0011] In addition, the winding devices are cylinders provided on their side surface with helical grooves shaped so as to receive inside them the cables which perform the upward and downward movement of the venetian blind.

[0012] Also in addition, the helical grooves on the winding devices also have the function of threads for displacing said winding devices axially along the common shaft, the winding points remaining stationary, i.e. always aligned with the exit holes of the first cables, and the rocker elements also remaining stationary with respect to the fourth side of the frame, which elements engage with the winding devices by means of a threaded hole formed therein, being driven initially so as to rotate together with the said winding devices in order to define the tilt of the slats of the venetian blind, said tilt being determined by a slot formed in the rocker element and designed to engage with a cable which is closed in a loop and driven by the said slot, the transverse elements thereof determining the tilt of the slats.

[0013] In particular, so as to allow rotation of the rocker elements together with the winding devices, internally threaded collars are used, said collars interacting with the rocker elements in the manner of a fric-

tion clutch.

[0014] Moreover, in particular, cradles are used in order to limit the rotation and stop the translation of the rocker elements, said cradles being engaged in a transverse surface of an H-shaped section, forming the upper side of the frame, and comprising a bottom surface, two first lugs engaging with the inner sides of the H-shaped section, two second lugs, which have the function of stopping the rocker elements when they have finished determining the direction of the slats of the blind while also keeping the rocker in an axially fixed position on the cradle, and two third lugs, which also engage with inner sides of the H-shaped section, so as to ensure, together with the first two lugs, secure fixing of the cradles to the H-shaped section.

[0015] The characterising features of the present invention are defined in detail in the claims at the end of the present description. However, other characteristic features and advantages of said invention will be defined fully in the following detailed description of a non-limiting example of embodiment thereof, accompanied by the attached drawings, in which:

- Figure 1 is a side elevation view, shown in schematic form for illustrative reasons, of a venetian double-glazing unit in accordance with the present invention;
- Figure 2 is an overall view of a frame for a double-glazing unit in accordance with the present invention;
- Figure 3 is a partial view, in axial cross-section, of an assembly for operating a venetian blind contained within the cavity of the double-glazing unit;
- Figure 4 is a side view of a right-hand cylindrical winding device forming part of the assembly for operating a venetian blind;
- Figure 5 is a side view of a left-hand cylindrical winding device forming part of the assembly for operating a venetian blind;
- Figure 6 is a cross-sectional view of a rocker element to be screwed onto the winding devices, both left-hand and right-hand, of the said assembly for operating a venetian blind;
- Figure 7 is an exploded side view of the rocker element provided with a friction collar;
- Figure 8 is a front view of the friction collar;
- Figure 9 is a bottom view of a cradle for retaining the rocker element;
- Figure 10 is a cross-sectional side view of the said cradle;
- Figure 11 is a cross-sectional view along the plane 11-11 of Figure 9;
- Figure 12 is a cross-sectional view along the plane 12-12 of Figure 9;
- Figure 13 is a cross-sectional view of the upper side of the frame for a double-glazing unit according to the invention showing details of the rocker, winding device and associated cradle and the exit cables for actuating a venetian blind in a double-glazing unit according to the present invention; and
- Figure 14 is a cross-sectional side view of a set of parallel glass panes and a venetian blind forming the main part of a double-glazing unit according to the invention.

[0016] Considering Figures 1, 2, and 14 together, it can be seen that a venetian double-glazing unit 10, in accordance with the invention, comprises two glass panes 12 and 14 (shown in Figure 14) enclosing between them a frame 16. The frame 16 encloses all four sides of the double-glazing unit and comprises three - lower and lateral - sides 18, 20 and 22, respectively forming compartments for a water-absorbent substance (silica gel, P_2O_5) which has the function of absorbing every trace of atmospheric humidity that may be found in a chamber 24 defined between the glass panes 12 and 14, and an upper side 26 capable of housing an actuating mechanism 28 of a venetian blind 30 for respectively raising, lowering and tilting the slats 32 of the venetian blind 30. The upper side 26 of the frame 16 is composed of an H-shaped metal section closed on top by a hermetically sealed curved cover 36 and contains an actuating mechanism which allows the venetian blind 30 to be raised and lowered and its slats 32 to be tilted. Raising and lowering of the blind 30 is performed by means of flexible cables 38 which are attached to a rounded lower beam 40 which has the function of keeping the blind 30 taut and is surrounded by a cable 42 arranged in the form of a closed loop and provided with cross-pieces 44 having the function of supporting the slats 32 which constitute the venetian blind 30.

[0017] The sides 18, 20, 22 and 26 of the frame 16 are connected together by corner pieces 46 and 48 between the sides 18, 20 and 22, by a simple corner piece 48 between sides 20 and 26, and by a mechanised corner piece 50 between the sides 22 and 26.

[0018] As is particularly clear in Figure 3, the mechanised corner piece 50 comprises an external casing 52, made of a moulded plastic material and extended by a notched plug 54 designed to be inserted into the side 22 of the frame 16 and closed by a cover 56 containing a reduction gear formed by a helical roller 58 and by a cylindrical toothed wheel 60 having helical teeth. The toothed wheel 60 is engaged onto a stepped shaft 62 having thereon a first Seger stop ring 64, a first metal bush 66, a spacer 68, a second metal bush 70 and a hermetically sealed assembly consisting of an O-ring gasket 72, a spacer 74 and a lip gasket 76, said hermetically sealed assembly being retained on the shaft 62 by a rocker 78 fixed to the casing 52, and by a second Seger stop ring 80 which co-operates with the first Seger ring 64 so as to keep the shaft 62 within the casing 52 of the corner piece 50. The shaft 62 terminates in an end 82 designed to be inserted into a coupling 84 for connecting the shaft 62 to a polygonal shaft 86 mounted

within the side 26 of the frame 16, under the cover 36. The polygonal shaft 86 (which is hexagonal for example) is inserted into a corresponding axial cavity of a cylindrical winding device 88 provided on its lateral surface with a helical cylindrical groove 90 which covers most of its surface.

[0019] Considering now additionally Figures 4 to 8, these figures illustrate, the cylindrical winding devices 88 as well as the rocker elements 92 which are provided with threaded axial holes 94 and are screwed onto the cylindrical winding devices 88, and with a slot 96 designed to accommodate at least one flexible cable 42 (see Figures 1, 3 and 14) to control the tilt of the slats 32 of the blind 30, said slot 96 extending into a cavity 98 for housing a clamp for securing the ends of the cable 42 accommodated in the slot 96. The rocker element 92 is provided on one side with a protruding nose 100 which has the function of limiting the travel movement of the rocker 92 on the winding device 88, when abutting onto a circular flange 102 provided at the same winding device 88. The flange 102 also has a notch 104 through which one end 38a of the flexible cable 38, intended to be wound on the helical groove 90, is passed. The same end 38a is secured by an elastic collar 106 which forcedly engages into a groove 108 formed on a cylindrical extension 110 of the winding device 88. Since the flexible cable 38 is fixed inside the notch 104 of the flange 102, it is rotatably driven by the winding device 88, being wound or unwound, according to the direction of rotation of the said winding device, on the helical groove 90, thus causing the venetian blind 30 to be raised or lowered.

[0020] From an examination of Figure 5 it can be observed that the left-hand cylindrical winding device 88a is a symmetrical mirror image of the right-hand winding device 88, so that all elements thereof have been indicated with the same numerical symbols used for the right-hand winding device 88, with the addition of the letter "a". For example, the helical groove 90a of the left-hand winding device 88a corresponds to the helical groove 90 of the right-hand winding device 88, the flange 102a corresponds to the flange 102, etc.

[0021] A collar 112 for regulating the frictional force is located next to the rocker 92 on the winding device 88, said collar comprising a cylindrical body 114 provided with a threaded axial hole 116, an external flange 117 and an internal flange 118 facing the rocker 92 and provided with sets of teeth 120 designed to mesh with corresponding teeth 122 present over the whole external flange 124 of the rocker 92. The assembly consisting of the rocker 92 and collar 112 with the mutually facing teeth 122 and 120 has the function of producing a driving friction effect which will be described in detail hereinafter.

[0022] From an examination now of Figures 9 to 13, it can be seen that a stopping cradle 130 is engaged in the transverse plane of the H-shaped metal section 34 which constitutes the upper side 26 of the frame 16. The cradle 130 comprises a bottom surface 132 from which there protrude two first lugs 134 and 136 which engage with the inner sides of the H-shaped section 34, two second lugs 138 and 140 which serve as a stop for the relief forming the cavity 98 of the rocker 88, and two third lugs 142 and 144, also engaging with the inner sides of the H-shaped profile 34. On the bottom 132 a first opening 146 is formed for allowing the passage of the cable 38 for raising and lowering the venetian blind 30, a second opening 148 for allowing the passage of the cable 42 for tilting the slats 32 of the said venetian blind 30, a first recess 150 for accommodating the flange 124 of the rocker 92 and the flange 118 of the collar 112 and a second recess 152 for accommodating the flange 117 of the collar 112.

[0023] A device according to the invention operates as follows :

if, for example, the venetian blind 30 were completely raised, then the cables 38 would be completely wound on the cylindrical winding devices 88 and 88a and to lower the blind 30 it would be necessary to unwind the cables 38 from the winding devices 88 and 88a. This can be achieved by causing the shaft 86 to rotate in the direction corresponding to unwinding of the cables 38. The blind 30 lowers to the point desired by the user, who can simply halt the descent by stopping rotation of the shaft 86. If it is required to raise the blind 30, it is sufficient to reverse the direction of rotation of the shaft 86 in order to cause the cables 38 to be rewound on the helical grooves 90 and 90a of the winding devices 88 and 88a.

[0024] As regards the tilt of the slats 32, the rockers 92 with their corresponding collars 112 start to operate, causing the tilt of the slats 32 to vary each time the direction of rotation of the shaft 86 is reversed, so that, rotation in a predefined direction determines the degree to which the blind 30 is lowered, and controlled reversal of the direction of rotation of said shaft 86 determines the desired tilt of the slats 32. In contrast, rotation of the shaft 86 in the opposite direction determines the degree to which the blind 30 is raised, and controlled reversal of said rotation determines the desired tilt of the slats 32.

[0025] The reason why this is possible is linked to the co-operation between the rocker elements 92, the associated collars 112 and the cradles 130 located in the H-shaped metal section 34 forming the upper side 26 of the frame 16.

[0026] The crucial aspect of the present invention, which causes, by means of simple rotation the shaft 86, the upward and downward movements of the venetian blind 30 and the tilting movement of its slats 32, is based on two facts :

a) the interaction between the rocker elements 92 and the associated collars 112 acting as clutch discs, their threads being pushed with a calibrated force against the facing threads of the winding device 88; and

b) the interaction between the assembly of rockers 92, collars 112 and cradles 130 which generates obstacles for the rockers 92 so that the same remain stationary while one of the winding devices 88 rotates inside them while moving along the common polygonal shaft 86, and the winding point is set in alignment with the opening 146 so as to allow the passage of the lifting cable 38.

[0027] By way of conclusion, when it is required to lower the venetian blind 30, the shaft 86 is rotated, causing rotation of the cylindrical winding devices 88, 88a so as to unwind the cables 38 from their helical grooves 90, 90a. As the rockers 92 and their collars 112 are in a position such that their threads are perfectly aligned, they consequently remain stationary with respect to the side 26 of the frame 16 while the winding devices 88, 88a rotate within them. When the rotation of the shaft 86 is reversed, the collars 112 are caused to move with respect to the rockers 92, misaligning their threads, and the rockers 92 are caused to rotate together with the winding devices 88, 88a, driving the cables 42 engaged in the slots 96 so as to define the tilt of the slats 32 of the blind 30. Therefore, a rotation of half a turn of the rockers 92 results in the tilt of the slats 32.

[0028] To summarise, rotating the shaft 86 in a first direction causes the blind 30 to lower, reversing rotation of the shaft 86 a first time causes the tilt of the slats 32 to change from open to shut or vice versa, continuing to rotate the shaft 86 in the opposite direction raises the blind 30 and reversing the rotation of the shaft 86 again causes the tilt of the slats 32 to change from shut to open or vice versa.

[0029] The above description illustrates an example of embodiment of the invention which should not be regarded as limiting, so that equivalent elements may be varied and replaced without departing from the scope of the invention as defined in the claims appended to the end of the present description.

Claims

1. Device for operating venetian blinds (30) comprising a plurality of slats (32) situated inside glas cavities (10) which are hermetically closed and formed by two glass panes (12, 14) gripping between them a sealed frame (16) which defines between the two panes (12, 14) an air chamber (24) isolated from the external environment and enclosing an atmosphere to be kept dehumidified, characterised in that the frame (16) comprises three sides (18, 20, 22) forming chambers for storing gas-drying substances and a fourth upper side (26) which is hermetically sealed and contains a mechanism (28) for actuating the venetian blind (30), comprising a plurality of winding devices (88, 88a) capable of winding up and unwinding a plurality of first cables (38) which, being wound up on the winding devices (88, 88a), move the venetian blind (30) upwards and, being unwound by the same winding devices (88, 88a), move the venetian blind (30) downwards and a second plurality of rocker elements (92), which are screwed onto the winding devices (88, 88a) and drive a plurality of second cables (42) which are closed in a loop and which, by means of their movement, in one direction and in the opposite direction, adjust the direction of the slats (32) of the venetian blind (30) and which act as a stop for the winding point of the first cables.

2. Device for operating venetian blinds (30) according to claim 1, characterised in that the sides (18, 20, 22) of the frame (16) are connected together by simple corner pieces (46, 48) and in that the upper side (26) is connected to the first lateral side (20) by a simple corner piece (46) and to the second lateral side (22) by a mechanised corner piece (50) provided with sealed means for activating the mechanism (28) actuating the venetian blind (30).

3. Device for operating venetian blinds (30) according to claim 2, characterised in that the sealed actuating means contained in the mechanised corner piece (50) consist of a reduction gear formed by a helical roller (58) and by a cylindrical toothed wheel (60) with helical teeth, engaged onto a stepped shaft (62) which forms a hermetic seal with the external casing (52) of the corner piece (50) by means of a set of gaskets (72, 76) arranged between the stepped shaft (62) and the external casing (52).

4. Device for operating venetian blinds (30) according to claim 3, characterised in that the stepped shaft (62) is kept positioned inside the casing (52) by a first Seger ring (64) which supports a first metal bush (66) followed by a spacer (68) and then by a second metal bush (70) and by the internal sealing assembly formed by a first O-ring gasket (72), by a spacer (74), by a second lip gasket (76), by a rocker (78) which retains the gaskets and finally by a second Seger ring (80), the stepped shaft (62) terminating in an end (82) designed to be inserted into a coupling (84) which connects the stepped shaft (62) to a differently shaped shaft (86), common to all the winding devices (88, 88a) arranged in the upper side (26) of the frame (16).

5. Device for operating venetian blinds (30) according to claim 4, characterised in that the shaft (86) common to all the winding devices (88, 88a) is a polygonal shaft, preferably a shaft with a hexagonal cross-section.

6. Device for operating venetian blinds (30) according

to claim 4 or 5, characterised in that the winding devices (88, 88a) are solid cylinders provided with an axial hole corresponding to the cross-section of the common shaft (86).

7. Device for operating venetian blinds (30) according to any of the preceding claims, characterised in that the winding devices (88, 88a) are cylinders provided on their side surface with helical grooves (90) shaped so as to receive inside them the cables (38) which perform the upward and downward movement of the venetian blind (30).

8. Device for operating venetian blinds (30) according to claim 7, characterised in that the helical grooves (90) on the winding devices (88. 88a) also have the function of threads for displacing said winding devices (88, 88a) with an axial translation movement relative to the rocker elements (92) which engage with the winding devices (88, 88a) by means of a threaded hole (94) formed therein, being driven initially so as to rotate together with the said winding devices (88, 88a) in order to define the tilt of the slats (32) of the venetian blind (30), said tilt being determined by a slot (96) formed in the rocker element (92) and designed to engage with a cable (42) which is closed in a loop and driven by the said slot (96), along the cross-pieces thereof determining the tilt of the slats.

9. Device for operating venetian blinds (30) according to claim 8, characterised in that in order to allow rotation of the rocker elements (92) together with the winding devices (88, 88a), internally threaded collars (112) are used which do interac with the rocker elements (92) as a friction clutch.

10. Device for operating venetian blinds (30) according to claim 9, characterised in that, in order to stop the rotation of the rocker elements (92), cradles (130) which are engaged in a transverse surface of an H-shaped section (34), forming the upper side (26) of the frame (16), and comprising a bottom surface (132), two first lugs (134, 136) engaging with the inner sides of the H-shaped section (34), two second lugs (138, 140), which have the function of stopping the rocker elements (92) when they have finished determining the tilt of the slats (32) of the blind (30) and two third lugs (140, 144), which also engage with inner sides of the H-shaped section (34) so as to ensure, together with the first two lugs (134, 136) a secure fixation of the cradles (130) to the H-shaped section (34).

Fig.1

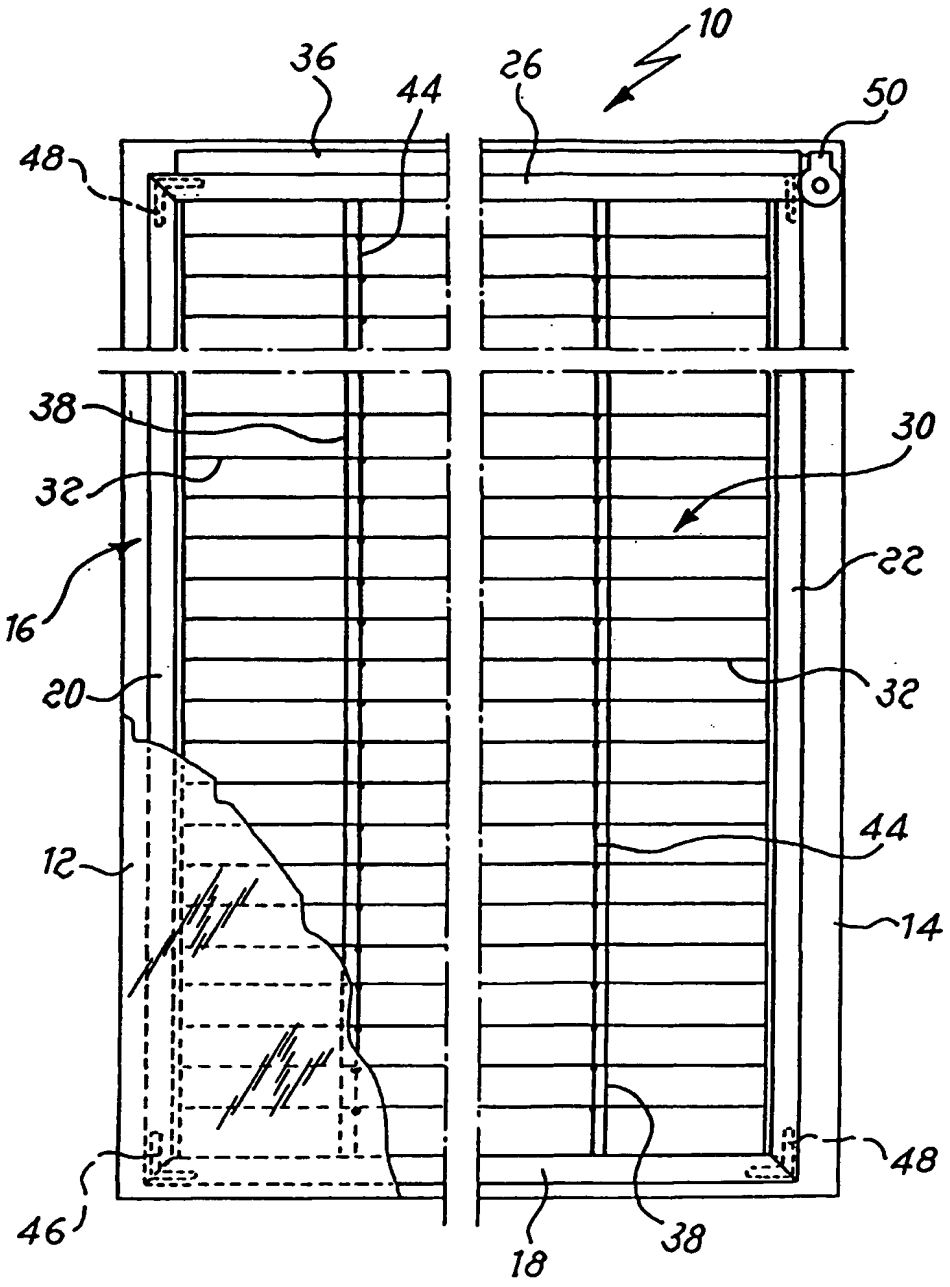
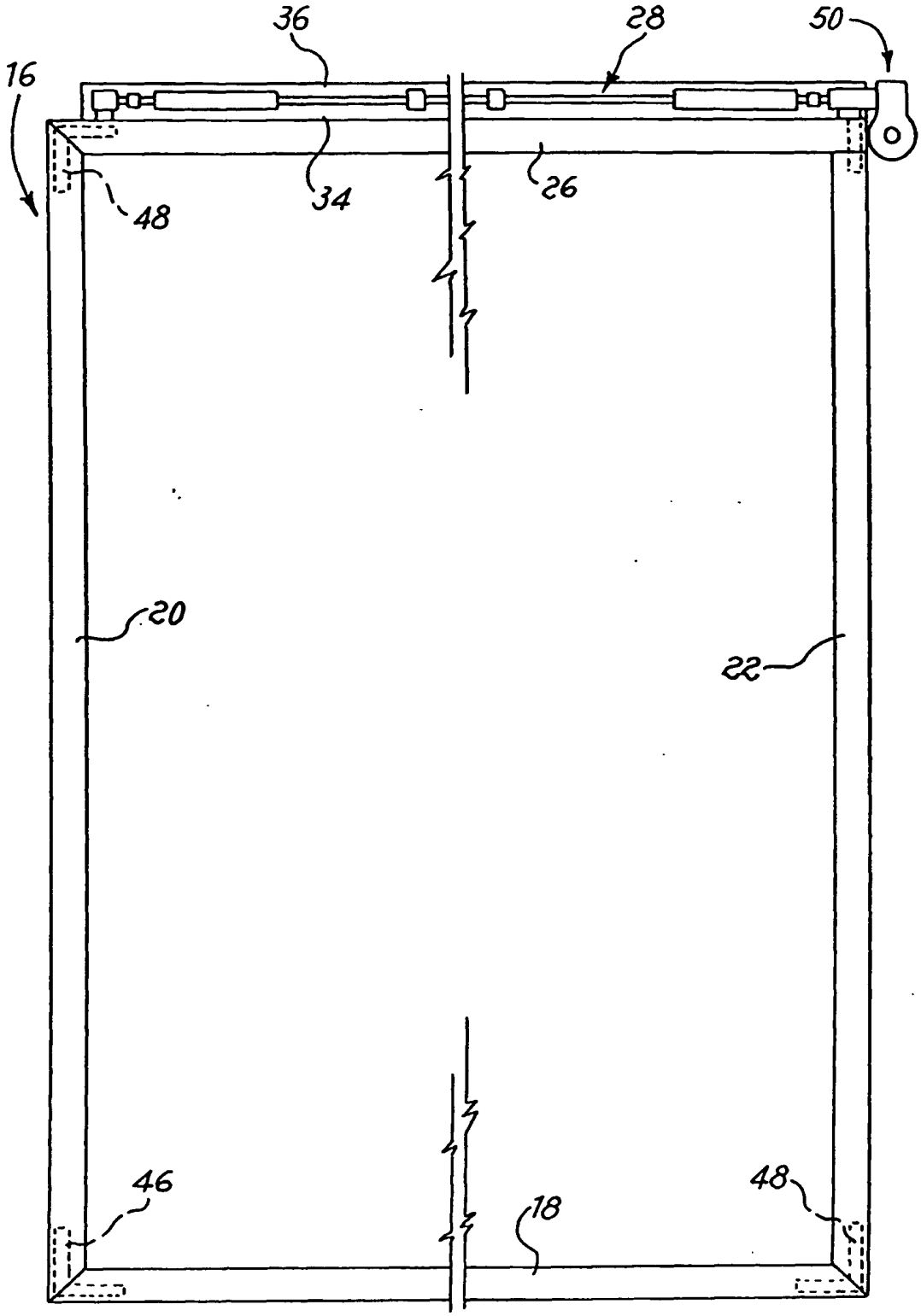


Fig.2



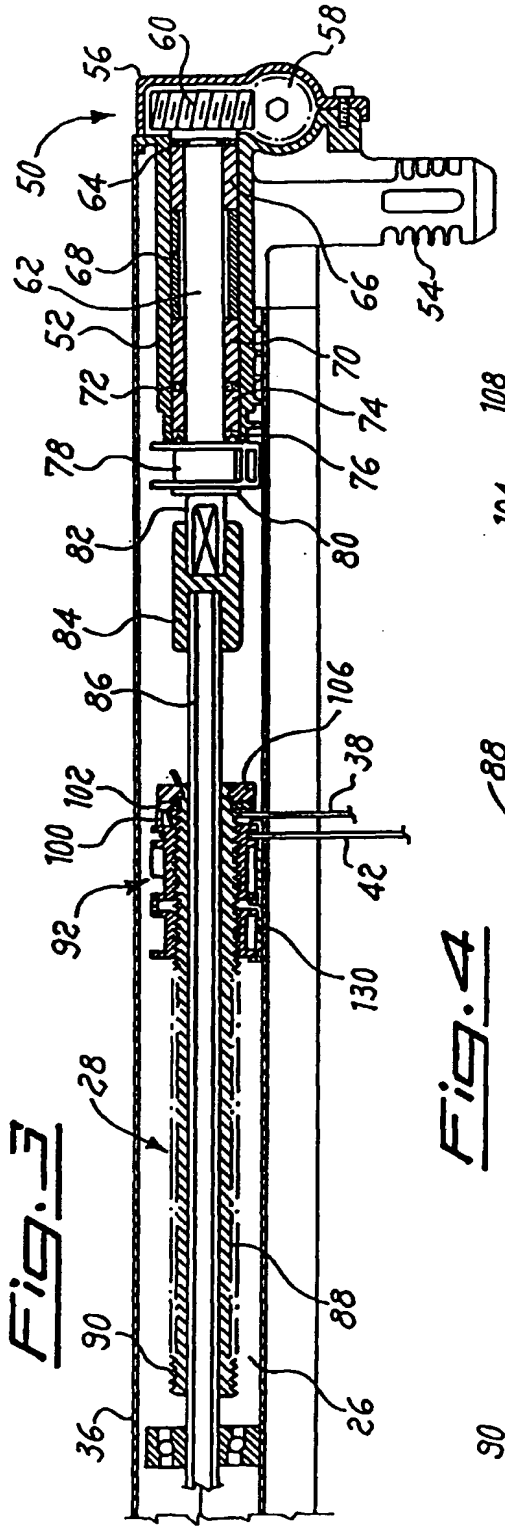


Fig.3

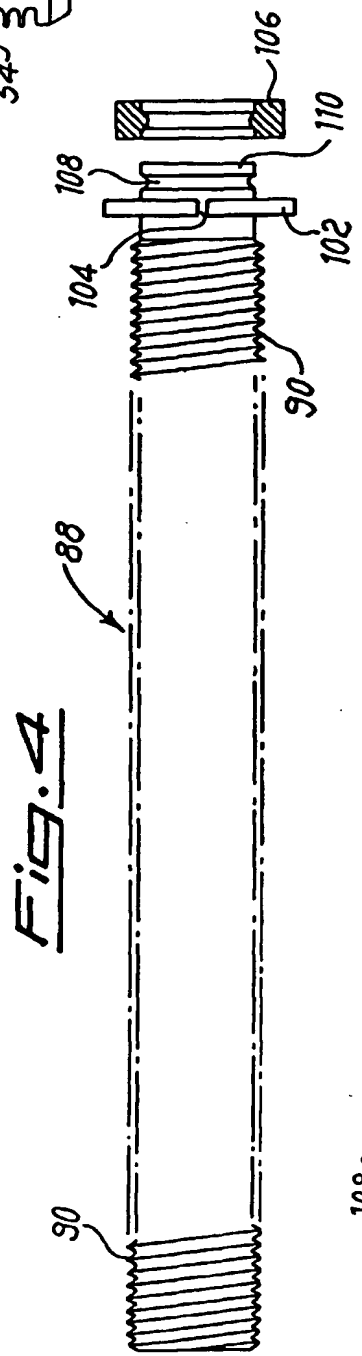


Fig.4

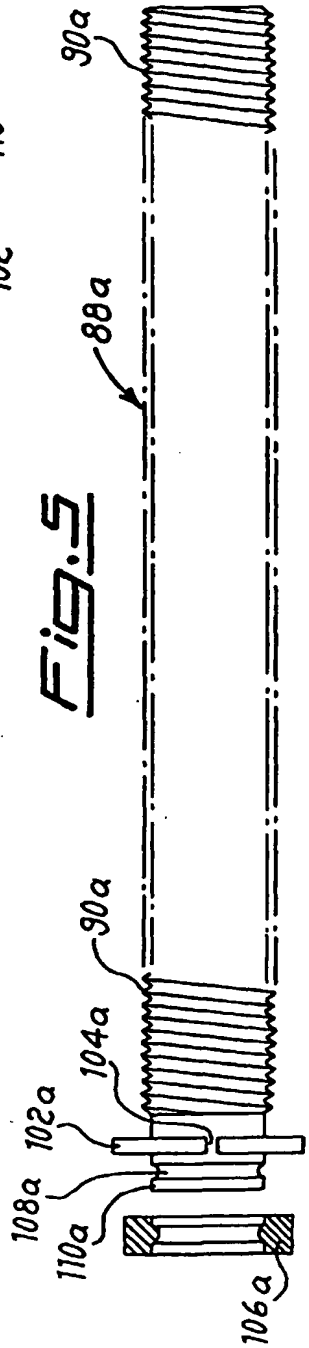


Fig.5

Fig.6

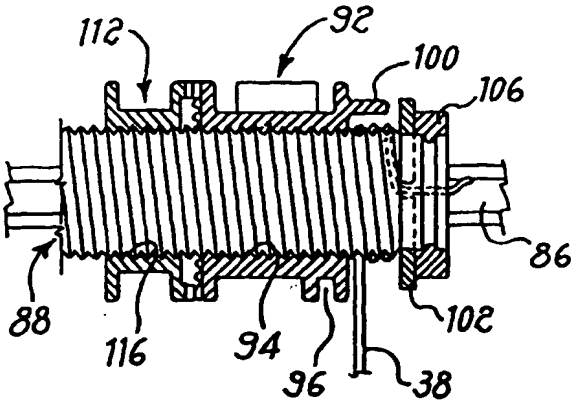


Fig.7

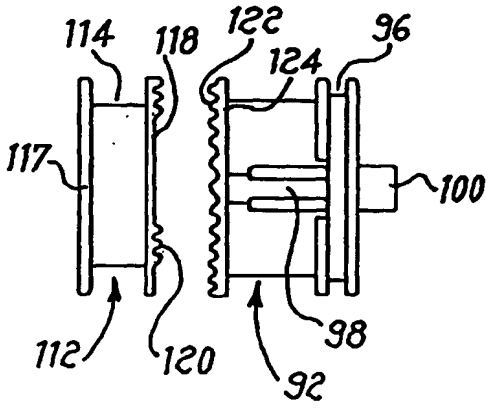


Fig.8

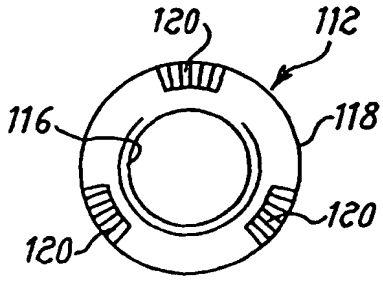


Fig.14

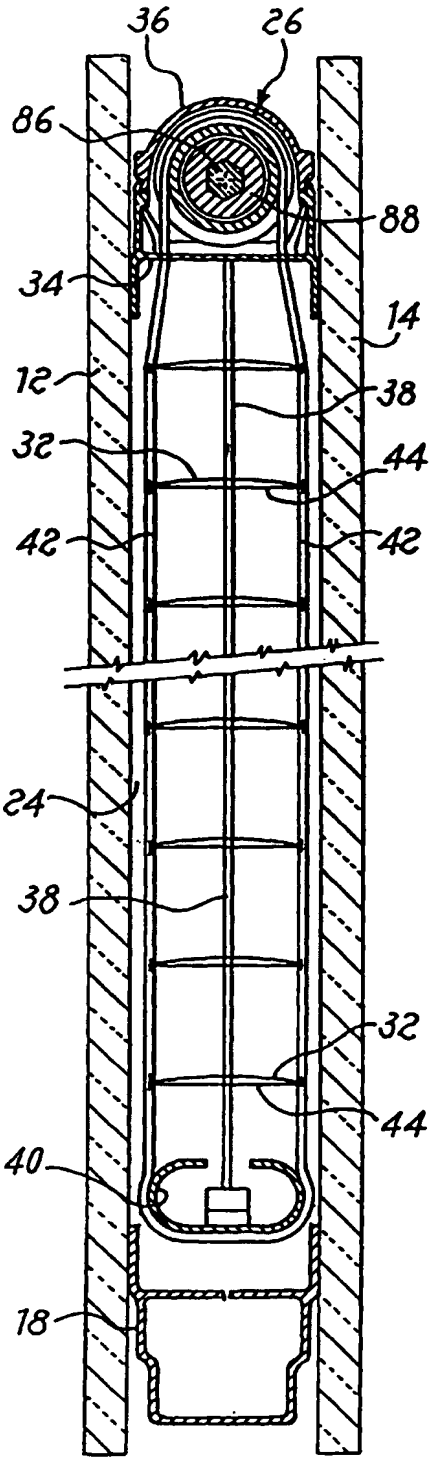


Fig. 9

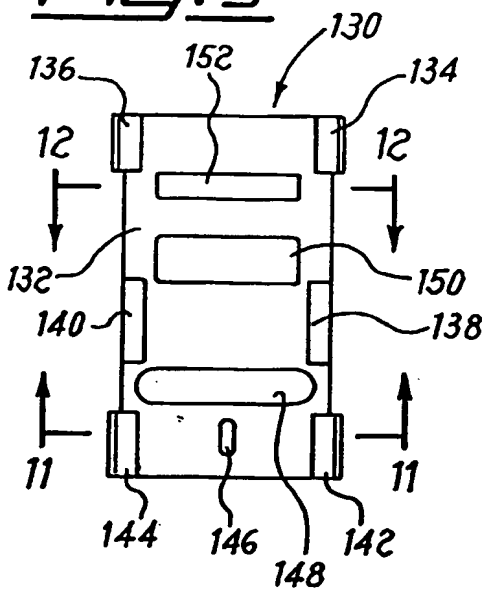


Fig. 10

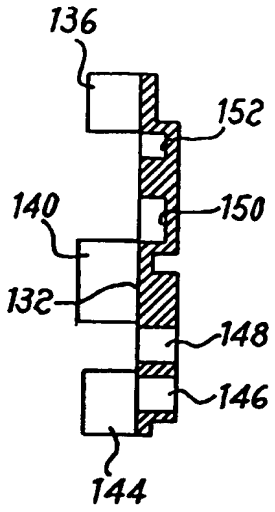


Fig. 11

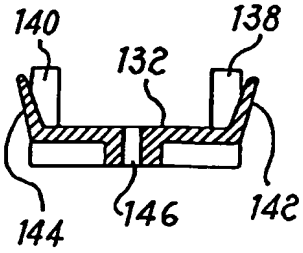


Fig. 12

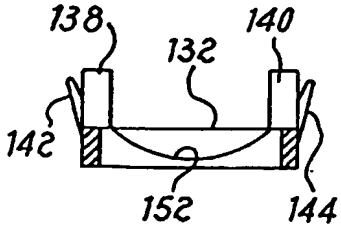
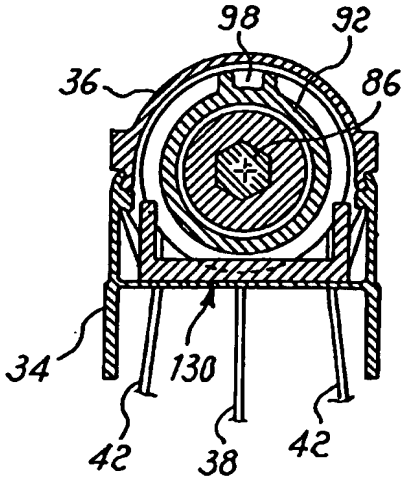


Fig. 13



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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	20 December 2000	Fordham, A

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